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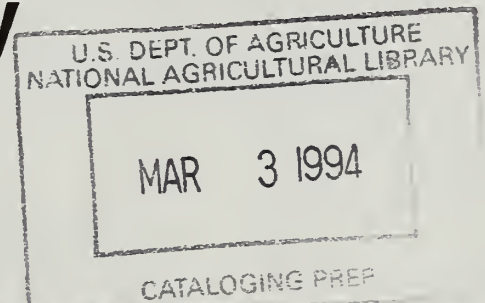
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Transportation Report

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Rural Bridges: An Assessment Based upon the National Bridge Inventory



Summary

This analysis, focusing on various characteristics of rural highway bridges, is derived from the most comprehensive single source of data concerning the Nation's highway bridges -- the National Bridge Inventory (NBI). As of December 31, 1988, the NBI contained information about 578,094 highway bridges, of which 81 percent were classified as rural.

Rural bridges tend to be older than urban bridges and a higher percentage have functional or structural inadequacies. Those rural bridges located on the Federal-Aid Highway System are generally in better condition than those off the system. In counties where agriculture contributes more than 10 percent to the county's economy, rural bridges, on average, are older with a higher percentage having structural or functional inadequacies.

A limitation of the NBI is that it only contains information for bridges that are 20 feet in length or longer. Although there is no national assessment of shorter bridges because of insufficient data, other studies by USDA's Office of Transportation have found that the many rural bridges less than 20 feet long also have inadequacies that affect access and mobility in rural areas.

Although the responsibility for the improvement of rural bridges varies from State to State, the local governments (county, city, town, and township) are responsible for a majority of the deficient or obsolete rural bridges. Given the various and complex bridge funding and management arrangements which exist throughout the United States, future improvements of rural bridges will require continued intergovernmental support and policies which acknowledge the importance of rural bridges to the Nation's economy.

Background

The collapse of the Silver Bridge between West Virginia and Ohio, in December 1967, called national attention to bridge conditions, prompting Congress to enact the Federal-Aid Highway Act of 1968 (Public Law 90-495). The act required the Federal Highway Administration (FHWA) within the U.S. Department of Transportation to establish the NBI. At that time, the NBI was an annual inventory of only Federal-Aid System bridges. Eventually, the NBI was expanded to include both Federal-Aid System and off-system bridges. A majority of the off-system bridges are located in rural areas.

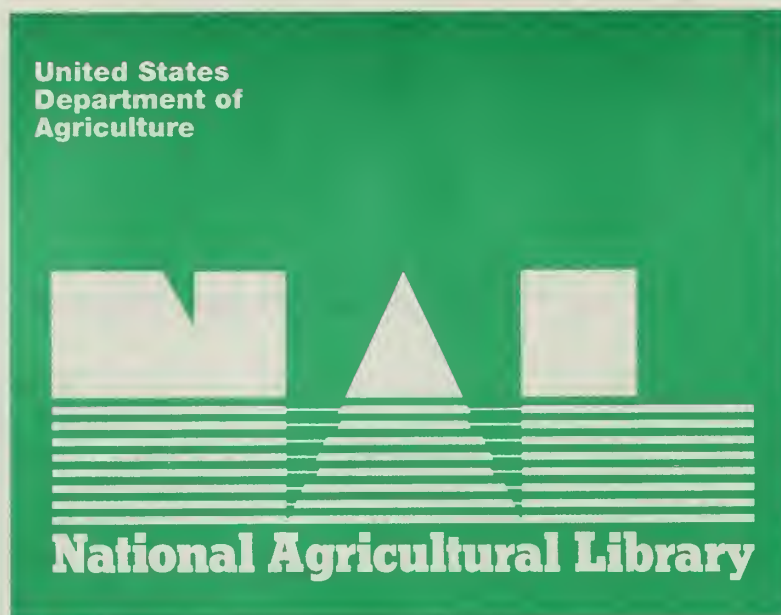
The NBI contains approximately 100 different data items which are descriptive of the Nation's bridges. Data items are used to provide characteristics such as age, size, structural condition, and governmental responsibility for maintenance.

Appendix A contains definitions of terms including bridge, inspection standards and bridge inventory.

The FHWA prepares reports to Congress based upon the NBI but does not provide detailed characteristics of bridges located in rural and agriculturally significant areas. This report provides specific information concerning these bridges as well as a comparison of rural and urban bridges, using NBI data as of December 31, 1988, supplied by FHWA's Office of Engineering, Bridge Division.

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Part 1: Comparison of Rural and Urban Bridges

The United States has 578,094 inventoried highway bridges, 81 percent of which are in rural areas. FHWA defines "rural" as areas with population centers of less than 5,000 people and "urban" as areas with populations of 5,000 or more. Over one-third of all rural bridges are in the seven states of Texas, Iowa, Kansas, Ohio, Illinois, Missouri, and Oklahoma. Whereas, one-third of all urban bridges are found in the five states of Texas, California, Ohio, New York, and Pennsylvania.

Table 1 shows the number of rural and urban bridges by State. Texas has the most rural bridges as well as the most urban bridges. Of all states, North Dakota has the highest percentage of rural bridges, 97 percent; Rhode Island, the lowest with 20 percent. (The District of Columbia has no rural areas and thus no rural bridges.)

Table 2 shows the number of rural and urban bridges in metropolitan (metro) and nonmetropolitan (nonmetro) counties. Metro and nonmetro are county wide classifications, while urban and rural refer to classifications within each county. Data pertaining to the classification of counties as metro or nonmetro were supplied by the U.S. Department of Agriculture's Economic Research Service (ERS). The ERS data were derived from statistics obtained from the U.S. Bureau of Census and U.S. Office of Management and Budget. By definition, a metro county contains an urbanized area with a city of 50,000 people or is adjacent to a very large population center. Therefore, a non-metro county does not contain a city with 50,000 people or is not adjacent to a very large population center. About 62 percent of all highway bridges are located in nonmetro counties.

Age of Bridges

For all inventoried bridges, the year of construction is recorded in the NBI. The earliest possible year of verifiable construction is 1900; therefore any bridge built before 1900 is recorded as being built in 1900. If the year built is unknown, the State provides a best estimate. The age of each bridge was calculated by subtracting the year built from the current year (1989). Bridges built in 1900 are considered to be 89 years old and bridges built in 1988 are considered to be 1 year old. Since the data contain records as of December 31, 1988, bridges built after 1988 are not included in this analysis. The determination of whether a bridge is rural or urban reflects the bridge's current location description, not its location at the time it was built. Therefore, the NBI does not contain data to indicate how many urban bridges originally were built in rural areas.

The average age of all bridges in the United States was found to be 35.5 years. In comparison, the ages of rural and urban bridges average 36.6 and 30.9 years, respectively.

More highway bridges were built in the 1960's than any other decade this century (see table 3). Half of all rural bridges were built before 1957; half of all urban bridges were built before 1963.

Lengths of Bridges

NBI data contains the length of the roadway supported by the bridge structure; the shortest length considered being 20 feet. The lengths are measured along the centerline of the roadway from paving notch to paving

Table 1--U.S. rural and urban highway bridges, rural share of total, by State

State	Number of bridges			Rural share of State total
	Rural	Urban	Total	
Alabama	13,202	2,332	15,534	85.0
Alaska	685	115	800	85.6
Arizona	4,534	1,089	5,623	80.6
Arkansas	11,591	1,423	13,014	89.1
California	13,074	9,203	22,277	58.7
Colorado	5,696	1,732	7,428	76.7
Connecticut	1,403	2,346	3,749	37.4
Delaware	386	352	738	52.3
Florida	5,760	4,428	10,188	56.5
Georgia	11,790	2,417	14,207	83.0
Hawaii	592	451	1,043	56.8
Idaho	3,332	413	3,745	89.0
Illinois	21,166	4,262	25,428	83.2
Indiana	14,409	3,108	17,517	82.3
Iowa	24,098	1,743	25,841	93.3
Kansas	23,968	1,680	25,648	93.4
Kentucky	11,630	961	12,591	92.4
Louisiana	11,952	2,189	14,141	84.5
Maine	2,194	389	2,583	84.9
Maryland	2,908	1,664	4,572	63.6
Massachusetts	2,052	2,908	4,960	41.4
Michigan	7,410	3,170	10,580	70.0
Minnesota	11,127	1,878	13,005	85.6
Mississippi	15,947	1,046	16,993	93.8
Missouri	20,789	2,893	23,682	87.8
Montana	4,356	276	4,632	94.0
Nebraska	15,144	699	15,843	95.6
Nevada	759	314	1,073	70.7
New Hampshire	2,133	439	2,572	82.9
New Jersey	2,184	3,823	6,007	36.4
New Mexico	2,857	582	3,439	83.1
New York	11,427	5,884	17,311	66.0
North Carolina	13,353	2,802	16,155	82.7
North Dakota	5,108	175	5,283	96.7
Ohio	23,270	5,910	29,180	79.7
Oklahoma	20,682	2,095	22,777	90.8
Oregon	5,622	986	6,608	85.1
Pennsylvania	17,076	5,465	22,541	75.8
Rhode Island	143	560	703	20.3
South Carolina	7,990	896	8,886	89.9
South Dakota	6,532	290	6,822	95.7
Tennessee	15,276	3,259	18,535	82.4
Texas	32,846	11,835	44,681	73.5
Utah	1,784	800	2,584	69.0
Vermont	2,501	164	2,665	93.8
Virginia	10,323	2,406	12,729	81.1
Washington	5,277	1,629	6,906	76.4
West Virginia	5,707	733	6,440	88.6
Wisconsin	10,589	2,374	12,963	81.7
Wyoming	2,551	275	2,826	90.3
District of Columbia	0	237	237	-
Puerto Rico	910	775	1,685	54.0
U.S. total	468,095	109,875	577,970 ^{1/}	81.0

^{1/} The number of U.S. total bridges will differ because of missing values.

Source: National Bridge Inventory, FHWA, U.S. DOT, as of December 31, 1988

Table 2--Distribution of rural and urban highway bridges, by nonmetro and metro counties

Location	Unit	Non-metro	Metro	Total
Rural	Number	339,974	124,953	464,927
	Row percent	73	27	100
	Column percent	95	57	81
Urban	Number	16,568	90,720	107,288
	Row percent	15	85	100
	Column percent	5	43	19
Total	Number	356,542	215,673	572,215 <u>1/</u>
	Row percent	62	38	100
	Column percent	100	100	100

1/ The number of U.S. total bridges will differ because of missing values.

Sources: National Bridge Inventory, FHWA, U.S. DOT, as of December 31, 1988;
and Economic Research Service, USDA, 1988

notch. This analysis indicates that rural bridges typically are shorter than urban bridges. Half of all rural bridges are less than 50 feet in length, while half of urban bridges are less than 123 feet. Their average lengths, however, are 111 and 256 feet, respectively. Although there are some extremely long bridges, 99 percent of the rural bridges are less than 665 feet in length, and 99 percent of the urban bridges are less than 2,093 feet in length.

Number of Lanes and Bridge Widths

Nearly 97 percent of all rural bridges have one or two lanes -- 20 percent are one-lane and 77 percent are two-lane. In comparison, 5 percent of all urban bridges are one-lane, 59 percent are two-lane, and the remainder have

three or more lanes. According to the NBI data, the average road surface width for a single-lane rural bridge is 16 feet. About 50,000 single-lane rural bridges, accounting for 11 percent of all rural bridges, have widths between 12 and 16 feet. It is important to note, however, that overall bridge widths were found to vary considerably because of additional bridge structures and safety features, such as sidewalks and guardrails. Other problems include the improper alignment of the road with bridge surface and guardrails that restrict the passage of wide machinery.

Governmental Responsibility for Bridges

The financial responsibility for construction and maintenance of bridges

Table 3--U.S. rural and urban highway bridges, by decade of construction

Decade built	Rural bridges <u>1/</u>		
	Number	Percent of total	Cumulative percentage
1900's	22,568	4.8	4.8
1910's	13,198	2.8	7.7
1920's	31,970	6.9	14.5
1930's	69,226	14.8	29.4
1940's	41,282	8.9	38.2
1950's	77,905	16.7	54.9
1960's	92,290	19.8	74.7
1970's	70,034	15.0	89.7
1980's	47,924	10.2	100.0
	Urban bridges <u>2/</u>		
	Number	Percent of total	Cumulative percentage
1900's	3,659	3.4	3.4
1910's	2,312	2.1	5.5
1920's	5,253	4.8	10.3
1930's	8,789	8.1	18.3
1940's	5,244	4.8	23.1
1950's	18,417	16.9	40.0
1960's	32,754	30.0	70.0
1970's	21,313	19.5	89.6
1980's	11,395	10.4	100.0

1/ - Half of all rural bridges were built before 1957.

2/ - Half of all urban bridges were built before 1963.

Source: National Bridge Inventory, FHWA, U.S. DOT, as of December 31, 1988

involves all levels of government, as seen in table 4. The majority of bridges (89 percent) are controlled by State and county governments with States being responsible for 46 percent of all bridges and counties for 43 percent.

Counties and other local governments together are responsible for 56 percent of all rural bridges; whereas these governments are responsible for 38 percent of urban bridges. States, on the other hand, have a greater responsibility for bridges in urban areas than in rural areas. Ninety-six percent of all county-maintained bridges are located on rural roads, compared with about three-fourths of all State-maintained bridges.

Even though governmental responsibilities vary considerably for bridge maintenance and repair nationwide, there are three basic approaches to

financing and administering rural bridges in the United States. The first is a centralized approach whereby State governments work through regional offices to fund bridge improvements (includes States such as Delaware, Virginia, West Virginia, and North Carolina). In the second approach, States work with a combination of county, town and township governments which share the responsibility for making improvements (19 States primarily in the Northeast and Midwest). In the third and most commonly used approach, States work with counties which share the responsibilities in unincorporated areas.

Construction Materials

The NBI data contains the type of material used to construct the main span of inventoried bridges. These

Table 4--U.S. highway bridges, rural and urban, by level of government responsible for bridge maintenance

	Local <u>1/</u>	County	State	Federal	Other	Total
Rural						
Number	27,532	236,414	199,663	1,885	2,601	468,095
Percent	5.9	50.5	42.7	0.4	0.5	100.0
Urban						
Number	30,716	11,028	64,850	83	3,198	109,875
Percent	28.0	10.0	59.0	0.1	2.9	100.0
Total						
Number	58,248	247,442	264,513	1,968	5,799	577,970 <u>2/</u>
Percent	10.1	42.8	45.8	0.3	0.1	100.0

1/ Includes incorporated cities, towns, townships, and other municipalities.

2/ The number of total bridges will differ because of missing values.

Source: National Bridge Inventory, FHWA, U.S. DOT, as of December 31, 1988

types were aggregated into 3 groups: concrete, steel and timber. A fourth category, "other", contains less common materials such as masonry or aluminum, and represents less than 1 percent of all bridges (see table 5).

In rural and urban areas, concrete is the material used most often in constructing the main bridge span. Steel is second and timber third. Timber bridges represent 9.5 percent of the Nation's inventoried bridges and are usually located on rural highways.

Operating Status of Bridges

The NBI assigns all inventoried bridges one of three possible operational status categories: (1) open to all traffic without restrictions (called "open"), (2) open to traffic with posted speed and/or weight restrictions ("posted"), and (3) closed to all traffic ("closed"). Of all bridges, 75 percent are open to all traffic. In rural areas, 72 per-

cent have no travel restriction, compared with 91 percent in urban areas (see table 6).

Nationwide, 24 percent of the bridges have posted speed and/or weight restrictions. Most of these bridges are located on rural roads. Twenty-seven percent of the rural bridges have posted restrictions, compared with only 8 percent of the urban bridges.

Condition of Bridges

Each bridge in the NBI is classified as being: (1) structurally deficient, (2) functionally obsolete, or (3) not deficient (neither structurally deficient nor functionally obsolete). FHWA defines a structurally deficient bridge as one that is restricted to light traffic only because it has deteriorated structural components, is closed, or needs immediate rehabilitation to remain open. A functionally obsolete bridge is one that has inade-

Table 5--U.S. rural and urban bridges by type of construction material

Location	Unit	Concrete	Steel	Timber	Other ^{1/}	Total
Rural	Number	235393	176752	53050	2862	468057 ^{2/}
	Percent	50.3	37.8	11.3	0.6	100.0
Urban	Number	63809	43004	2076	956	109845 ^{2/}
	Percent	58.1	39.2	1.9	0.8	100.0
Total	Number	299202	219756	55126	3818	577902 ^{2/}
	Percent	51.8	38.0	9.5	0.7	100.0

^{1/} Other materials may include masonry and aluminum.

^{2/} The number of total bridges will differ because of missing values.

Source: National Bridge Inventory, FHWA, U.S. DOT, as of December 31, 1988

Table 6--U.S. rural and urban highway bridges by operational status

Location	Unit	Open	Posted	Closed	Total
Rural	Number	334,524	127,438	4,566	466,528 <u>1/</u>
	Row percent	72	27	1	100
Urban	Number	99,789	8,562	690	109,041 <u>1/</u>
	Row percent	91	8	1	100
Total	Number	434,313	136,000	5,256	575,569 <u>1/</u>
	Row percent	75	24	1	100

1/ The number of total bridges will differ because of missing values.

Source: National Bridge Inventory, FHWA, U.S. DOT, as of December 31, 1988

quate deck geometry, is improperly aligned with the roadway leading to it, or has inadequate load-carrying capacity or insufficient underclearances. If a bridge is both structurally deficient and functionally obsolete, FHWA classifies it as structurally deficient. Appendix B contains a listing of NBI data items that are used to determine bridge conditions.

Fourty-three percent of all bridges were found to have structural or functional inadequacies -- 24 percent are classified as structurally deficient and another 19 percent are considered to be functionally obsolete (see table 7). The percentages are nearly the same for rural bridges because they comprise 81 percent of the total. In comparison, 31 percent of urban bridges are inadequate for structural and functional reasons.

Proposed Improvements for Bridges

The NBI also contains information about the type of work proposed by bridge custodians to improve the condition of deficient or obsolete bridges. Table 8 presents the types of improvement needed for rural and urban bridges. In rural areas, bridge officials indicated that three-fourths of the deficient or obsolete bridges need replacement. In urban areas, needed improvements are more evenly divided between the need for replacement and rehabilitation.

Table 7--U.S. rural and urban highway bridges, by condition

Location and unit	Structurally deficient	Functionally obsolete	Structurally and functionally adequate	Total bridges
Rural number	120,852	95,939	251,304	468,095
row percent	26	20	54	100
Urban number	17,823	16,302	75,750	109,875
row percent	16	15	69	100
Total number	138,675	112,241	327,054	577,970 1/
row percent	24	19	57	100

1/ The number of total bridges will differ because of missing values.

Source: National Bridge Inventory, FHWA, U.S. DOT, as of December 31, 1988

Table 8--U.S. rural and urban deficient or obsolete highway bridges by proposed type of improvement needed

Location	Percent of bridges by type of improvement				
	Widening	Replacement	Rehabilitation	Other	Total
Rural	8	76	13	3	100
Urban	9	44	38	9	100
Total	8	73	16	3	100

Note: Bridge widening is often done with rehabilitative or replacement improvements, therefore the percentage of bridges needing widening may be underestimated. Improvement types referred to as "other" include strengthening structural components or adding over- or undercrossings. Proposed improvement types were not reported for all bridges, therefore only percentages are shown.

Source: National Bridge Inventory, FHWA, U.S. DOT, as of December 31, 1988

Part 2: Rural Bridges

The deteriorating condition of bridges is of great concern to rural America. Because the NBI data indicate that many rural bridges are old and need improvements, this section highlights important characteristics of rural bridges and those located in agriculturally significant counties.

State and local governments receive some Federal funds for the improvement of deficient or obsolete bridges. Most of the Federal funds are used to replace and rehabilitate bridges located on the Federal-Aid Highway System. The Federal Highway Bridge Replacement and Rehabilitation Program (HBRRP) requires that States spend 15 to 35 percent of the Federal bridge funds for bridges located off the Federal-Aid System, which are referred to as off-system bridges. According to the NBI, about 92 percent of all off-system bridges are rural.

Governmental Responsibility for Rural Bridges

Although responsibility for administering and financing rural bridge improvements is usually at the State or county level, it varies considerably from State to State. Table 9 shows for each State the percentage of rural bridges by level of government. City or local governments are responsible for 6 percent of all rural bridges. In Vermont and Illinois, where towns and townships exist, city or local governments are responsible for over 50 percent of the rural bridges. But nationwide, county governments are responsible for 50 percent of all rural bridges; and State governments, 43 percent. The highest percentages of State-maintained rural bridges are in Delaware, North Carolina, Virginia and West Virginia, because these

States utilize a centralized approach to highway administration. Federally maintained bridges listed in the NBI represent less than one-half of one percent of all rural bridges and are located primarily in the Western States (Arizona, Idaho, Nevada, and Utah). The remainder of the rural bridges are owned by private concerns, such as utilities, railroads or a combination of governmental entities.

Condition of Rural Bridges

Table 10 shows the number and percentage by State of rural bridges that are structurally deficient, functionally obsolete, or neither (not structurally deficient or functionally obsolete). Missouri has the most structurally deficient rural bridges and Texas has the most functionally obsolete rural bridges. In New York, 65 percent of rural bridges are structurally deficient, the highest percentage of structurally deficient to total rural bridges for an individual State. Montana has the highest percentage (55 percent) of functionally obsolete to total rural bridges. And finally, on a percentage basis, Arizona appears to have the most adequate rural bridges.

Table 11 shows which levels of government have custodial responsibility of deficient or obsolete bridges. Overall, county governments are responsible for 63 percent of the Nation's deficient or obsolete rural bridges and State governments are responsible for 30 percent. The counties' share of deficient bridges is larger than their share of all bridges, while the reverse is true for State-controlled bridges. It is interesting to note that the States which have high percentages of rural bridges being controlled by city or local governments (other than counties) also have higher percentages of local or city-maintained deficient or obsolete bridges, as in Illinois.

Table 9--U.S. rural bridge maintenance responsibilities, by level of government, by State

State	City or Local	County	State	Federal	Other <u>1/</u>
Percent					
Alabama	.1	69.3	30.1	.3	.2
Alaska	4.2	2.0	86.3	3.9	3.5
Arizona	.5	16.7	77.6	5.0	.2
Arkansas	.1	49.4	50.5	-	-
California	.5	52.6	44.2	.9	1.8
Colorado	-	54.8	45.0	.2	-
Connecticut	41.6	.1	55.7	-	2.6
Delaware	-	-	97.9	1.0	1.0
Florida	.3	46.0	51.9	.9	.8
Georgia	.2	59.7	39.8	.1	.2
Hawaii	.5	42.9	56.1	.5	-
Idaho	24.8	41.1	31.7	2.3	.2
Illinois	56.3	16.9	25.6	.1	1.1
Indiana	-	74.7	25.2	-	.1
Iowa	.3	86.1	13.0	-	.6
Kansas	-	82.5	17.4	-	.1
Kentucky	1.6	33.1	65.0	-	.3
Louisiana	.9	43.6	53.2	1.7	.7
Maine	19.7	-	74.4	.7	5.2
Maryland	1.3	42.1	48.5	.4	7.7
Massachusetts	44.7	5.6	49.1	.2	.3
Michigan	2.3	70.0	27.6	-	.2
Minnesota	1.2	78.3	19.8	.6	.1
Mississippi	.4	72.2	26.8	.4	.2
Missouri	.1	62.4	37.5	-	-
Montana	.4	53.1	46.3	-	.1
Nebraska	.3	79.4	19.6	.1	.5
Nevada	.9	13.0	81.0	4.2	.8
New Hampshire	42.0	.1	55.7	.2	2.0
New Jersey	.6	55.4	30.6	.1	13.3
New Mexico	.2	13.0	86.5	.2	.1
New York	12.7	48.4	38.7	-	.2
North Carolina	-	-	98.7	1.3	-
North Dakota	.1	79.4	19.7	.5	.3
Ohio	.2	70.0	29.2	-	.5
Oklahoma	1.5	70.6	27.7	-	.2
Oregon	.4	64.1	35.4	-	.1
Pennsylvania	15.0	14.0	69.2	.1	1.7
Rhode Island	4.9	-	65.0	-	30.1
South Carolina	.1	11.6	88.3	-	-
South Dakota	-	72.7	26.2	1.1	-
Tennessee	.1	62.2	36.3	1.4	-
Texas	.2	32.7	67.0	.1	.1
Utah	.7	32.4	60.1	6.6	.3
Vermont	59.8	-	38.7	.3	1.2
Virginia	.6	.1	97.0	1.3	.9
Washington	2.7	62.9	34.0	-	.3
West Virginia	.2	.1	99.1	-	.6
Wisconsin	43.8	25.8	29.5	.6	.3
Wyoming	-	30.8	67.5	.7	1.0
U.S. total	5.9	50.5	42.7	.4	.5

1/ "Other" includes private or a combination of custodial responsibilities.

Note: State percentages may not add to 100 percent because of rounding.

Source: National Bridge Inventory, FHWA, U.S. DOT, as of December 31, 1988

Table 10--Condition of U.S. rural highway bridges, by State

State	Struc. defic. <u>1/</u>	Func. obsol. <u>2/</u>	Neither <u>3/</u>	Struc defic. <u>1/</u>	Func obsol. <u>2/</u>	Neither <u>3/</u>
	Number of bridges			Percentage within State		
Alabama	3896	3305	6001	30	25	45
Alaska	88	31	566	13	5	83
Arizona	146	230	4158	3	5	92
Arkansas	1592	4418	5581	14	38	48
California	1426	3470	8178	11	27	63
Colorado	1964	401	3331	34	7	58
Connecticut	343	534	526	24	38	37
Delaware	43	97	246	11	25	64
Florida	550	1147	4063	10	20	71
Georgia	3289	2067	6434	28	18	55
Hawaii	98	146	348	17	25	59
Idaho	542	589	2201	16	18	66
Illinois	4473	1852	14841	21	9	70
Indiana	3618	3736	7055	25	26	49
Iowa	5869	6319	11910	24	26	49
Kansas	5262	7178	11528	22	30	48
Kentucky	2336	5529	3765	20	48	32
Louisiana	3683	2461	5808	31	21	49
Maine	376	335	1483	17	15	68
Maryland	473	949	1486	16	33	51
Massachusetts	826	120	1106	40	6	54
Michigan	2174	581	4655	29	8	63
Minnesota	1608	1659	7860	14	15	71
Mississippi	6858	2677	6412	43	17	40
Missouri	12492	2615	5682	60	13	27
Montana	484	2395	1477	11	55	34
Nebraska	7743	1215	6186	51	8	41
Nevada	38	104	617	5	14	81
New Hampshire	448	655	1030	21	31	48
New Jersey	513	377	1294	23	17	59
New Mexico	341	308	2208	12	11	77
New York	7403	918	3106	65	8	27
North Carolina	933	6916	5504	7	52	41
North Dakota	1964	1096	2048	38	21	40
Ohio	3721	1547	18002	16	7	77
Oklahoma	7472	4371	8839	36	21	43
Oregon	533	557	4532	9	10	81
Pennsylvania	4889	2661	9526	29	16	56
Rhode Island	19	17	107	13	12	75
South Carolina	951	721	6318	12	9	79
South Dakota	1601	1552	3379	25	24	52
Tennessee	3839	2576	8861	25	17	58
Texas	5143	7672	20031	16	23	61
Utah	186	69	1529	10	4	86
Vermont	492	809	1200	20	32	48
Virginia	1350	2621	6352	13	25	62
Washington	673	797	3807	13	15	72
West Virginia	2493	1375	1839	44	24	32
Wisconsin	3189	1375	6025	30	13	57
Wyoming	323	357	1871	13	14	73
Puerto Rico	86	432	392	9	47	43
U.S. total	120852	95939	251304	26	20	54

1/ - Structurally deficient2/ - Functionally obsolete3/ - Neither structurally deficient nor functionally obsolete

Note: State percentages may not add to 100 percent because of rounding.

Source: National Bridge Inventory, FHWA, U.S. DOT, as of December 31, 1988

Table 11--U.S. rural deficient or obsolete bridges, by level of government responsible for maintenance, by State

State	City or Local	County	State	Federal	Other <u>1/</u>
Percent					
Alabama	.1	76.9	22.9	-	.2
Alaska	6.7	6.7	68.0	9.3	9.2
Arizona	1.2	42.3	52.4	4.3	-
Arkansas	.2	75.7	24.1	-	-
California	.5	80.2	17.6	1.1	.6
Colorado	-	82.7	17.3	-	-
Connecticut	44.2	-	51.9	-	3.9
Delaware	-	-	96.4	2.1	1.4
Florida	.3	63.9	32.6	2.6	.5
Georgia	.2	67.8	31.6	.1	.4
Hawaii	-	46.3	52.9	.8	-
Idaho	32.4	53.3	10.0	4.0	.4
Illinois	70.6	10.0	16.9	.1	2.3
Indiana	-	80.8	19.0	-	.2
Iowa	.3	93.0	5.9	-	.8
Kansas	-	92.1	7.8	-	.1
Kentucky	1.6	44.1	53.8	.1	.4
Louisiana	.3	61.6	36.0	1.8	.3
Maine	47.5	-	49.1	.1	3.2
Maryland	1.2	47.6	47.3	.1	3.8
Massachusetts	68.0	-	31.3	.1	.6
Michigan	2.2	87.2	10.4	-	.2
Minnesota	1.7	87.8	9.9	.4	.2
Mississippi	.2	81.4	17.7	.3	.4
Missouri	.1	78.5	21.4	-	-
Montana	.4	65.8	33.6	-	.1
Nebraska	.2	91.6	7.6	.2	.5
Nevada	2.1	16.2	76.8	4.9	-
New Hampshire	68.2	.3	27.8	.5	3.3
New Jersey	1.5	69.1	20.5	.2	8.8
New Mexico	.9	28.7	70.0	.2	.3
New York	14.9	53.2	31.7	.1	.2
North Carolina	-	-	99.6	.4	.0
North Dakota	.0	87.1	12.0	.4	.5
Ohio	.4	75.3	23.6	-	.7
Oklahoma	.7	81.0	18.1	-	.2
Oregon	.8	77.5	21.3	-	.4
Pennsylvania	16.4	15.9	65.2	-	2.5
Rhode Island	5.6	-	41.7	-	52.8
South Carolina	.2	36.1	63.5	-	.1
South Dakota	.0	94.3	5.3	.3	-
Tennessee	.1	71.6	27.5	.8	-
Texas	.4	65.3	34.2	-	.1
Utah	1.6	69.0	22.8	5.88	.8
Vermont	76.1	-	22.1	.31	1.5
Virginia	.6	.1	97.2	.1	2.0
Washington	3.1	48.5	47.6	-	.8
West Virginia	.3	.1	98.7	-	.8
Wisconsin	54.0	23.6	21.1	.7	.5
Wyoming	-	80.6	19.3	.2	-
U.S. total	6.3	62.9	30.0	.3	.6

1/ "Other" includes private or a combination of custodial responsibilities.

Note: State percentages may not add to 100 percent because of rounding.

Source: National Bridge Inventory, FHWA, U.S. DOT, as of December 31, 1988

Overall, this seems to indicate that State-maintained bridges are in better condition than county, city, or other locally maintained bridges.

Rural Bridges On and Off the Federal-Aid Highway System

Nationwide, there are 468,095 rural highway bridges. Fifty-nine percent, or 276,864, are located off the Federal-Aid Highway System; a third are in six states -- Iowa, Ohio, Kansas, Texas, Illinois, and Oklahoma (see table 12). In contrast, only 23 percent (25,634) of all urban bridges are located off the System.

The remaining 41 percent (or 191,231) of all rural bridges are on the Federal-Aid Highway System. They are located on highways classified as Interstate, Primary, or Secondary routes, as shown in table 13, and carry nearly 90 percent of the average daily traffic (ADT) on rural bridges. It is important to note, however, that ADT in and of itself does not measure the economic value of a bridge. A third of all rural on-system bridges are in seven states -- Texas, Kansas, Ohio, Illinois, California, Missouri and Mississippi.

Of all off-system rural bridges, 58 percent are structurally deficient or functionally obsolete. In comparison, only 30 percent of on-system rural bridges have structural or functional inadequacies. Tables 14 and 15 show the number and percentage of deficient and obsolete bridges by State for bridges located on and off the Federal-Aid Highway System. Except for the State of Washington, all States report a higher percentage of deficient or obsolete bridges located off-system than on-system. Of all rural off-system bridges, the five States with the highest percentage of inadequate (both structurally deficient and functionally obsolete) bridges are Missouri, New York, West

Virginia, Kentucky, and Montana. Over three-fourths of all rural off-system bridges in these States are structurally deficient or functionally obsolete. The four States of New York, Connecticut, Montana and West Virginia each have 50 percent or more of their on-system rural bridges with structural or functional inadequacies.

Sufficiency Rating: Eligibility for Federal Funds

One of the most critical applications of the NBI data is to determine Federal eligibility for bridge funds. The HBRRP directs FHWA to apportion bridge program funds based upon each State's relative share of the estimated costs to improve inadequate bridges nationwide; and allows an individual State a maximum of 10 percent and a minimum of 0.25 percent of the available funds.

To determine HBRRP funding eligibility, FHWA utilizes a mathematical formula which incorporates 19 NBI data elements to calculate a sufficiency rating, which is a numeric value indicative of a bridge's sufficiency to remain in service. The sufficiency rating formula consists of three main evaluation factors and each factor is assigned a relative weight. The factors and their maximum relative weights are: (1) structural adequacy and safety, 55 percent, (2) serviceability and functional obsolescence, 30 percent and (3) essentiality for public use, 15 percent. Also, there is a fourth factor referred to as "special reductions". When applicable, these account for a maximum reduction of 13 percentage points in the sufficiency rating (see appendix C).

Sufficiency ratings are always greater than or equal to 0 percent and less than or equal to 100 percent; with 0 percent representing an entirely insufficient or deficient bridge and

Table 12--U.S. rural highway bridges on and off the Federal-Aid Highway System, by State

State	On Federal-Aid Highway System		Off Federal-Aid Highway System	
	Number	Percent	Number	Percent
Alabama	6017	45.6	7185	54.4
Alaska	501	73.1	184	26.9
Arizona	3715	81.9	819	18.1
Arkansas	4665	40.2	6926	59.8
California	7065	54.0	6009	46.0
Colorado	2294	40.3	3402	59.7
Connecticut	626	44.6	777	55.4
Delaware	161	41.7	225	58.3
Florida	3126	54.3	2634	45.7
Georgia	5965	50.6	5825	49.4
Hawaii	339	57.3	253	42.7
Idaho	1405	42.2	1927	57.8
Illinois	7136	33.7	14030	66.3
Indiana	4816	33.4	9593	66.6
Iowa	6046	25.1	18052	74.9
Kansas	9612	40.1	14356	59.9
Kentucky	4093	35.2	7537	64.8
Louisiana	4767	39.9	7185	60.1
Maine	939	42.8	1255	57.2
Maryland	1331	45.8	1577	54.2
Massachusetts	1154	56.2	898	43.8
Michigan	3318	44.8	4092	55.2
Minnesota	3832	34.4	7295	65.6
Mississippi	6901	43.3	9046	56.7
Missouri	6931	33.3	13858	66.7
Montana	2225	51.1	2131	48.9
Nebraska	4608	30.4	10536	69.6
Nevada	540	71.1	219	28.9
New Hampshire	884	41.4	1249	58.6
New Jersey	1029	47.1	1155	52.9
New Mexico	2240	78.4	617	21.6
New York	4169	36.5	7258	63.5
North Carolina	3838	28.7	9515	71.3
North Dakota	1633	32.0	3475	68.0
Ohio	7449	32.0	15821	68.0
Oklahoma	6801	32.9	13881	67.1
Oregon	3041	54.1	2581	45.9
Pennsylvania	6817	39.9	10259	60.1
Rhode Island	70	49.0	73	51.0
South Carolina	3598	45.0	4392	55.0
South Dakota	2549	39.0	3983	61.0
Tennessee	5282	34.6	9994	65.4
Texas	18667	56.8	14179	43.2
Utah	1080	60.5	704	39.5
Vermont	1155	46.2	1346	53.8
Virginia	4933	47.8	5390	52.2
Washington	2608	49.4	2669	50.6
West Virginia	2705	47.4	3002	52.6
Wisconsin	4410	41.6	6179	58.4
Wyoming	1679	65.8	872	34.2
Puerto Rico	466	51.2	444	48.8
U.S. total	191231	40.9	276864	59.1

Source: National Bridge Inventory, FHWA, U.S. DOT, as of December 31, 1988

Table 13--U.S. rural bridges, by type of road system and average daily traffic

Road system	Number of rural bridges	Percentage of rural bridges	Average daily traffic (ADT) ^{1/}	Percentage of rural ADT ^{2/}
On Federal-Aid Highway System:				
Interstate System	30,035	6.4	9,568	36.7
Primary System	69,726	14.9	4,286	37.2
Secondary System:				
State roads	50,872	10.9	1,779	11.3
Local roads	40,608	8.7	864	4.4
Total	191,241	40.9	3,722	89.6
Off Federal-Aid Highway System:				
Other State roads	36,267	7.7	748	3.4
Other local roads	240,597	51.4	230	7.0
Total	276,864	59.1	298	10.4
U.S. total	468,095	100.0	1,697	100.0

^{1/} Average daily traffic (ADT) represents the number of vehicles using a bridge in a single day for a given year. For this analysis, the year reportings range from 1978 through 1988. Any ADT reported before 1978 was not used in the calculation of ADT for a specific type of road system.

^{2/} Percentage of rural ADT was derived by first multiplying the average ADT by the actual number of bridges to obtain the aggregate daily number of vehicles for a particular road system group. Then, each road system's aggregate number of vehicles was divided by the sum of all road systems' aggregate number of vehicles.

Source: National Bridge Inventory, FHWA, U.S. DOT, as of December 31, 1988

Table 14--U.S. rural bridges on the Federal-Aid Highway System, by State

State	Deficient or obsolete bridges <u>1/</u>	Adequate bridges <u>2/</u>	Percentage of def. or obs. to all on-system bridges <u>3/</u>	Percentage of def. or obs. to all rural bridges <u>4/</u>
Alabama	2604	3413	43	55
Alaska	49	452	10	17
Arizona	238	3477	6	8
Arkansas	1325	3340	28	52
California	1518	5547	21	37
Colorado	363	1931	16	42
Connecticut	368	258	59	63
Delaware	34	127	21	36
Florida	595	2531	19	29
Georgia	2201	3764	37	45
Hawaii	133	206	39	41
Idaho	208	1197	15	34
Illinois	1267	5869	18	30
Indiana	1889	2927	39	51
Iowa	1555	4491	26	51
Kansas	2865	6747	30	52
Kentucky	1953	2140	48	68
Louisiana	1568	3199	33	51
Maine	150	789	16	32
Maryland	568	763	43	49
Massachusetts	345	809	30	46
Michigan	723	2595	22	37
Minnesota	625	3207	16	29
Mississippi	3107	3794	45	60
Missouri	2845	4086	41	73
Montana	1232	993	55	66
Nebraska	1284	3324	28	59
Nevada	74	466	14	19
New Hampshire	206	678	23	52
New Jersey	278	751	27	41
New Mexico	378	1862	17	23
New York	2491	1678	60	73
North Carolina	1220	2618	32	59
North Dakota	667	966	41	60
Ohio	1454	5995	20	23
Oklahoma	2647	4154	39	57
Oregon	395	2646	13	19
Pennsylvania	2664	4153	39	44
Rhode Island	8	62	11	25
South Carolina	613	2985	17	21
South Dakota	414	2135	16	48
Tennessee	1720	3562	33	42
Texas	3549	15118	19	39
Utah	64	1016	6	14
Vermont	418	737	36	52
Virginia	1409	3524	29	38
Washington	826	1782	32	28
West Virginia	1471	1234	54	68
Wisconsin	1485	2925	34	43
Wyoming	125	1554	7	27
Puerto Rico	260	206	56	57
U.S. total	56448	134783	30	46

1/ Bridges that are structurally deficient or functionally obsolete.

2/ Bridges that are neither structurally deficient nor functionally obsolete.

3/ The number of structurally deficient and functionally obsolete bridges as a percent of total on-system rural bridges.

4/ The number of structurally deficient and functionally obsolete bridges as a percent of total rural bridges.

Source: National Bridge Inventory, FHWA, U.S. DOT, as of December 31, 1988

Table 15--U.S. rural bridges off the Federal-Aid Highway System, by State

State	Deficient or obsolete bridges <u>1/</u>	Adequate bridges <u>2/</u>	Percentage of def. or obs. to all off-system bridges <u>3/</u>	Percentage of def. or obs. to all rural bridges <u>4/</u>
Alabama	4597	2588	64	55
Alaska	70	114	38	17
Arizona	138	681	17	8
Arkansas	4685	2241	68	52
California	3378	2631	56	37
Colorado	2002	1400	59	42
Connecticut	509	268	66	63
Delaware	106	119	47	36
Florida	1102	1532	42	29
Georgia	3155	2670	54	45
Hawaii	111	142	44	41
Idaho	923	1004	48	34
Illinois	5058	8972	36	30
Indiana	5465	4128	57	51
Iowa	10633	7419	59	51
Kansas	9575	4781	67	52
Kentucky	5912	1625	78	68
Louisiana	4576	2609	64	51
Maine	561	694	45	32
Maryland	854	723	54	49
Massachusetts	601	297	67	46
Michigan	2032	2060	50	37
Minnesota	2642	4653	36	29
Mississippi	6428	2618	71	60
Missouri	12262	1596	88	73
Montana	1647	484	77	66
Nebraska	7674	2862	73	59
Nevada	68	151	31	19
New Hampshire	897	352	72	52
New Jersey	612	543	53	41
New Mexico	271	346	44	23
New York	5830	1428	80	73
North Carolina	6629	2886	70	59
North Dakota	2393	1082	69	60
Ohio	3814	12007	24	23
Oklahoma	9196	4685	66	57
Oregon	695	1886	27	19
Pennsylvania	4886	5373	48	44
Rhode Island	28	45	38	25
South Carolina	1059	3333	24	21
South Dakota	2739	1244	69	48
Tennessee	4695	5299	47	42
Texas	9266	4913	65	39
Utah	191	513	27	14
Vermont	883	463	66	52
Virginia	2562	2828	48	38
Washington	644	2025	24	28
West Virginia	2397	605	80	68
Wisconsin	3079	3100	50	43
Wyoming	555	317	64	27
Puerto Rico	258	186	58	57
U.S. total	160343	116521	58	46

1/ Bridges that are structurally deficient or functionally obsolete.

2/ Bridges that are neither structurally deficient nor functionally obsolete.

3/ The number of structurally deficient and functionally obsolete bridges as a percent of total off-system rural bridges.

4/ The number of structurally deficient and functionally obsolete bridges as a percent of total rural bridges.

Source: National Bridge Inventory, FHWA, U.S. DOT, as of December 31, 1988

100 percent representing an entirely sufficient bridge.

All bridges that have sufficiency ratings from 50.0 to 80.0 percent are eligible for rehabilitation using Federal bridge funds. Bridges with sufficiency ratings less than 50.0 percent are eligible for replacement. Table 16 shows the percentage, by State, of rural bridges that are eligible for HBRRP funding. It is important to note that not all bridges eligible for Federal funding will be rehabilitated or replaced using Federal funds. The individual States prioritize and select a portion of their bridges for improvement using a combination of funds.

Bridges in Agriculturally Significant Counties

In studies conducted by USDA's Economic Research Service (ERS), counties in the 48 contiguous States has been classified as farming-dependent, farming-important or not-farming-dependent. In the 514 farming-dependent counties, farming contributed at least 20 percent of the total labor and proprietor income (LPI) in 1980-84. Farming-dependent counties are mostly in regions referred to as the Great Plains and western Corn Belt. Also, 540 counties are defined as farming-important, that is, 10-19 percent of the county's total LPI comes from farming. For this analysis, farming-dependent and farming-important counties are combined and classified as agriculturally significant counties, representing 1,054 counties or 34 percent of all U.S. counties. An agriculturally significant county is not necessarily a large producer of agricultural commodities, but a county where agriculture is a substantial component of the local economy. A very small percentage (less than 1 percent) of all bridges are located in counties without agricultural classifications. These counties were located primarily

in Alaska, Hawaii, and Puerto Rico, which were not included in the ERS study.

Approximately 25 percent of the Nation's bridges, representing 30 percent of all rural bridges, are located in agriculturally significant counties. Almost all (97 percent) bridges in agriculturally significant counties are located on rural highways.

The following summarizes characteristics of rural bridges in agriculturally significant counties.

- o As of December 31, 1988, the average age of a bridge in an agriculturally significant county is 37.2 years, whereas the average age of all other bridges is 34.9 years.
- o Rural bridges in agriculturally significant counties have more structural and functional inadequacies than those in non-agriculturally significant counties -- 27 percent are structurally deficient and 22 percent are functionally obsolete. In comparison, of the rural bridges that are not located in agriculturally significant counties -- 23 percent are structurally deficient and 19 percent are functionally obsolete.
- o Slightly more rural bridges located in agriculturally significant counties are single-lane -- 22 percent are only capable of carrying one lane of traffic.
- o Of all rural bridges in agriculturally significant counties, 66 percent are open to all traffic and 33 percent restrict traffic with posted weight or speed limitations. About 1 percent are closed completely.
- o About 47 percent of rural bridges in agriculturally significant counties utilize concrete as the

Table 16--U.S. rural bridges, number and percentages, by eligibility for Federal Funds as determined by NBI sufficiency ratings, by State

State	Not eligible 1/	Rehab. 2/	Replac. 3/	Not eligible 1/	Rehab. 2/	Replac. 3/
	Number			Percent		
Alabama	3253	5130	4819	25	39	37
Alaska	265	314	105	39	46	15
Arizona	3223	1146	165	71	25	4
Arkansas	3066	4585	3940	26	40	34
California	6940	4212	1922	53	32	15
Colorado	2127	1608	1961	37	28	34
Connecticut	657	520	226	47	37	16
Delaware	245	99	42	63	26	11
Florida	2831	2129	800	49	37	14
Georgia	5180	3536	3074	44	30	26
Hawaii	171	232	188	29	39	32
Idaho	2066	749	517	62	22	16
Illinois	12289	4591	4286	58	22	20
Indiana	7075	3257	4077	49	23	28
Iowa	8588	9403	6107	36	39	25
Kansas	8141	9128	6699	34	38	28
Kentucky	3918	4832	2880	34	42	25
Louisiana	3995	3942	4015	33	33	34
Maine	929	888	377	42	40	17
Maryland	1286	928	694	44	32	24
Massachusetts	1051	340	660	51	17	32
Michigan	4193	1299	1918	57	18	26
Minnesota	7127	2240	1760	64	20	16
Mississippi	4455	3847	7645	28	24	48
Missouri	3599	5808	11382	17	28	55
Montana	1841	1676	839	42	38	19
Nebraska	5275	3756	6113	35	25	40
Nevada	581	139	39	77	18	5
New Hampshire	886	639	608	42	30	29
New Jersey	884	697	603	40	32	28
New Mexico	1611	993	253	56	35	9
New York	2515	4054	4858	22	35	43
North Carolina	4146	4970	4237	31	37	32
North Dakota	2190	1202	1716	43	24	34
Ohio	11056	7306	4908	48	31	21
Oklahoma	7021	4839	8822	34	23	43
Oregon	3192	1875	551	57	33	10
Pennsylvania	7022	5788	4266	41	34	25
Rhode Island	75	34	34	52	24	24
South Carolina	2768	4180	1042	35	52	13
South Dakota	2651	1901	1980	41	29	30
Tennessee	6761	5003	3512	44	33	23
Texas	16546	8696	7604	50	26	23
Utah	1020	525	239	57	29	13
Vermont	758	965	778	30	39	31
Virginia	4783	3836	1704	46	37	17
Washington	2647	2089	540	50	40	10
West Virginia	1439	1922	2346	25	34	41
Wisconsin	5014	3278	2297	47	31	22
Wyoming	1537	622	392	60	24	15
Puerto Rico	290	450	170	32	49	19
U.S. total	191179	146198	130710	41	31	28

1/ - Not eligible for Federal bridge funds

2/ - Eligible for rehabilitation with Federal bridge funds.

3/ - Eligible for replacement with Federal bridges funds.

Source: National Bridge Inventory, FHWA, U.S. DOT, as of December 31, 1988

principle structural material and 38 percent are made of steel. Timber is used for 15 percent of all rural bridges in agriculturally significant counties, which is above the national average.

Table 17 shows the number of rural bridges that are located in agriculturally significant counties by State. Over half of all rural bridges in these counties are located in the seven states of Iowa, Kansas, Nebraska, Texas, Missouri, Minnesota, and Illinois. States with more than half of its rural bridges located in agriculturally significant counties include Nebraska, North Dakota, South Dakota, Iowa, Minnesota, Idaho, Wisconsin, Kansas and Arkansas.

Additional Information on Rural Bridges

Additional information concerning characteristics of rural bridges is available electronically through USDA's electronic information dissemination system.

Additional data include characteristics of rural bridges on a State-by-State basis. These characteristics include, for instance, age, construction material and operational status.

Table 17--U.S. rural highway bridges located in agriculturally significant counties, by State ^{1/}

	Number of bridges			Percent agric. sign.
	Agric. sign. counties	Non- agric. sign. counties	Total ^{2/}	
Alabama	2527	10675	13202	19.1
Arizona	340	3911	4251	8.0
Arkansas	5946	5645	11591	51.3
California	4622	8452	13074	35.4
Colorado	2312	3384	5696	40.6
Connecticut	0	1398	1398	-
Delaware	160	226	386	41.5
Florida	1199	4561	5760	20.8
Georgia	3262	8528	11790	27.7
Idaho	1997	1335	3332	59.9
Illinois	6770	14396	21166	32.0
Indiana	2429	11980	14409	16.9
Iowa	15872	8226	24098	65.9
Kansas	13293	10675	23968	55.5
Kentucky	3158	8472	11630	27.2
Louisiana	1506	10446	11952	12.6
Maine	0	2194	2194	-
Maryland	262	2428	2690	9.7
Massachusetts	0	2050	2050	-
Michigan	701	6709	7410	9.5
Minnesota	7248	3879	11127	65.1
Mississippi	3433	12500	15933	21.5
Missouri	7309	13400	20709	35.3
Montana	1770	2585	4355	40.6
Nebraska	11986	3158	15144	79.1
Nevada	98	659	757	12.9
New Hampshire	0	2133	2133	-
New Jersey	0	2184	2184	-
New Mexico	613	2162	2775	22.1
New York	0	11427	11427	-
North Carolina	3486	9865	13351	26.1
North Dakota	3717	1391	5108	72.8
Ohio	1564	21706	23270	6.7
Oklahoma	5190	15492	20682	25.1
Oregon	1386	4235	5621	24.7
Pennsylvania	637	16439	17076	3.7
Rhode Island	0	143	143	-
South Carolina	360	7630	7990	4.5
South Dakota	4675	1848	6523	71.7
Tennessee	1299	13977	15276	8.5
Texas	9168	23678	32846	27.9
Utah	193	1591	1784	10.8
Vermont	631	1870	2501	25.2
Virginia	902	9380	10282	8.8
Washington	2139	2917	5056	42.3
West Virginia	0	5707	5707	-
Wisconsin	5892	4677	10569	55.7
Wyoming	44	2507	2551	1.7
U.S. total	140096	324831	464927	30.1

^{1/} County designations in regards to local dependence on agricultural is based upon data supplied by the Economic Research Service, USDA

^{2/} The number of total bridges will differ because of missing values.

Source: National Bridge Inventory, FHWA, U.S. DOT, as of December 31, 1988

APPENDIX A

Definitions of Terms

Bridge.

The National Bridge Inspection Standards published in the Code of Federal Regulations (23 CFR 650.3) give the following definition for a bridge:

A structure, including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between undercopings of abutments or spring lines of arches; or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.

National Bridge Inspection Standards (NBIS).

Federal regulations establishing the requirements for inspection procedures frequency of inspections, qualifications of personnel, inspection reports, and preparation and maintenance of a State bridge inventory. The NBIS apply to all structures defined as bridges located on any road under the jurisdiction of and maintained by a public authority and open to public travel.

National Bridge Inventory.

The aggregation of structure inventory and appraisal data collected to fulfill the requirements of the NBIS that each State shall prepare and maintain an inventory of all bridges subject to the NBIS. These data are furnished and stored in compact alphanumeric format on magnetic tapes or disks suitable for electronic data processing.

Source: Recording and Coding Guide for the Structural Inventory and Appraisal of the Nation's Bridges, U.S. Department of Transportation, Federal Highway Administration, Office of Engineering, Bridge Division, Bridge Management Branch.

APPENDIX B

National Bridge Inventory Items Used to Determine Bridge Conditions

Items used to classify bridges as structurally deficient:

- 1) Deck condition
- 2) Superstructure condition
- 3) Substructure condition
- 4) Culvert (if applicable)
- 5) Structural condition
- 6) Waterway adequacy (if applicable)

Items used to classify bridges as functionally obsolete:

- 1) Deck geometry
- 2) Underclearances
- 3) Structural condition
- 4) Approach alignment
- 5) Waterway adequacy (if applicable)

Source: Recording and Coding Guide for the Structural Inventory and Appraisal of the Nation's Bridges, U.S. Department of Transportation, Federal Highway Administration, Office of Engineering, Bridge Division, Bridge Management Branch.

APPENDIX C

Summary of National Bridge Inventory Sufficiency Rating Factors

Factors	Items	Weight
F1) Structural adequacy and safety	Superstructure condition Substructure condition Culvert (if applicable) Inventory rating	55 percent
F2) Serviceability and functional obsolescence	Defense highway designation Lanes on structure Average daily traffic Approach roadway width Structure type Bridge roadway width Vertical clearances over deck Deck condition Structural condition Deck geometry Underclearances Waterway adequacy Approach roadway alignment	30 percent
F3) Essentiality for public use	Defense highway designation Detour length Average daily traffic	15 percent
F4) Special reductions	Detour length Traffic safety features Structure type	13 percent

Sufficiency rating = F1 + F2 + F3 - F4
and ranges from 0 to 100

Source: Recording and Coding Guide for the Structural Inventory and Appraisal of the Nation's Bridges, U.S. Department of Transportation, Federal Highway Administration, Office of Engineering, Bridge Division, Bridge Management Branch.

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